

Remarks

In view of the amendments to claims 1-3, and 13 the Examiner's rejections of claims 1-8, 13 and 14 as being indefinite are deemed to be traversed. Antecedent basis have been provided for the objected to language in claims 1, 2, 3 and 7. Claim 9 has been amended to recite water and gas pressures used in the method. These pressures are supported in the specification at page 11, lines 11 – 13. Claim 13 has been amended to more clearly indicate the structural cooperation between the discharge tube, the eductor and the gas intake nipple as well as deleting the term "bore" as being redundant since the discharge tube implicitly would have a bore.

The rejection of claims 1, 9 and 10 under 35 U.S.C. 103(a) over Grisdale et al. in view of Terry has been considered. Claim 1 and claim 9 have been amended to more clearly and patentably distinguish applicant's invention over the combination of references.

In Grisdale an air expanded foam is formed in a trough which is open at one face so that as the foam expands and exudes from the container into a mine shaft for the purpose of extinguishing the fire. In Grisdale et al. the foam flows like water, essentially by gravity, and preferably through a shaft that is downwardly biased to reach the area involved in fire. In the event there are openings in the floor of the shaft or depressions or the like, the foam, like water, will tend to follow the path of least resistance and/or concentrate in these areas. The flow of the foam toward the area involved in fire will be negated or at least considerably reduced. In addition, it cannot be seen that using the Grisdale et al. technique that a mine cavity could be completely filled to smother hot spots on the sides and top portions of the shaft as contrasted to applicant's method where the nitrogen expanded foam is dispersed under pressure to the area involved in fire.

Terry teaches the use of a gas expanded mud cement which is pumped into a mine cavity involved in fire to completely seal and fill it and to provide support to avoid subsidence. Terry provides a list of commonly available gases for expanding the mud and they are used merely to increase the volume of the cellular concrete. There is no teaching in Terry of any preference for nitrogen. Once the cavity is sealed with Terry's concrete reentry to resume production in that section of the mine will be difficult and time consuming. The use of the expanded concrete for anything other than sealing a shaft or chamber is not preferred because such concretes are quick setting and do not readily flow.

There is no disclosure or suggestion in either reference of the use of nitrogen to expand a foam in a flowing stream of foam concentrate/liquid mixture and it is clear that the combination of Terry with the apparatus of Grisdale et al. would not achieve the results gained by applicant's method as set forth in this application, nor does the combination suggest the apparatus used in the present invention.

Claims 1 and 9-11 have been rejected as being obvious over Hunter. Hunter relates to a low pressure system for disbursing fire suppressant foam. Hunter maintains gas pressure of between 30 psi and 90 psi. There is no disclosure or suggestion that the system described by Hunter would be useful for the suppression of fires in mine shafts where, due to long reaches, gas pressure on the order of 100 psi and water pressure on the order of 90 psi are normally employed to get the proper disbursement of the nitrogen expanded foam.

Contrary to the Examiner's position, it is not obvious to disperse a fire suppressant comprising nitrogen expanded foam through an ingress port to extinguish a fire in a mine shaft. In the book entitled Mine Fires, Donald W. Mitchell cited at page 6 beginning at line 14 of applicant's specification the author discusses the use of foam in mine fires and introduces the

chapter relating to the use of foam with the statement “[H]igh expansion foams have not yet extinguished a real mine fire.” It is clear that prior to applicant’s invention those skilled in the art of fighting mine fires would not be lead to the use of a water based gas expanded foam, particularly nitrogen expanded foam, to extinguish a mine fire. However, as set forth in a real life example in the specification, the application of nitrogen expanded foam resulted in the complete extinguishment of a fire in a coal mine in a matter of a few days as contrasted to weeks, months or years that it normally takes to extinguish a coal mine fire, if the fire can be extinguished at all, utilizing conventional procedures. A great advantage of applicant’s method for extinguishing a mine fire in accordance with the present invention is that the mine can be returned to production in a relatively short period after the fire is extinguished, see the Example in applicant’s specification. This is to be contrasted with the use water, air expanded foams, mud cements or the like conventionally used, such as utilized by Terry in which the shaft is completely filled with an expanded mud concrete. In addition, the apparatus described in Hunter is not particularly suited for extinguishing mine fires since large volumes of water and foam disbursed at relatively high pressure are normally required to reach and fill with nitrogen expanded foam an area of a mine shaft to cover hot spots on the sides or the ceiling of the area of the shaft involved in the fire. The amendment to claim 9 patentably distinguishes it and its dependent claims 10 and 11 from Hunter. Hunter’s low pressure system is not suited for extinguishing fire in confined areas where the foam must be directed into an area that is not normally readily accessible and often remote from the point of disbursement and accordingly must disbursed at high pressure to reach and cover the surfaces involved in fire.

The indication of allowable subject matter in claims 12, 2-8, 13 and 14 is noted with appreciation and new claim 15 has been submitted to contain the subject matter of claim 3.

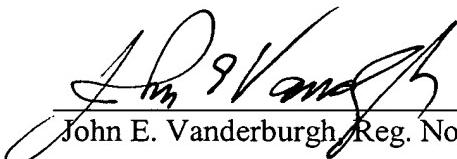
Claims 2, 4-8 and 12 have been amended to depend from claim 15 and although these claims have not been rewritten in independent form they are now deemed to be allowable since they depend from an independent claim that contains the limitations of the base claim and intervening claims.

Claim 13 has been amended to overcome the section 112 rejections and thus are deemed to be allowable.

In view of the foregoing amendments and remarks it is submitted that the claims now in this case define patentable subject matter and are not disclosed or suggested by the references cited by the mine. Accordingly, it is respectfully requested that the mine withdraw the rejection of the claims and issue a notice of allowance in this case.

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